

## Assignment 4 : Q1: Report

### **Question 1 Segmenting a Brain Magnetic Resonance (MR) Image**

All required codes are implemented in “myMainScript.m” located in ‘code’ folder of Question 1.

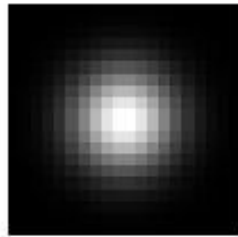
#### **Reporting**

##### **Part a**

Chosen value of  $q = 2$  which we got by optimisation

##### **Part b**


Neighbourhood mask = Gaussian ( window size = 20 , sigma = 3)



##### **Part c**

Initial Membership is uniform across all classes and assumed to be  $1/K$  at each pixel within brain for each class. Outside brain it does not matter. Image for the same is shown below. Motivation behind this is, because we don't have any prior information about class of each pixel so it is best to assume uniform.

Membership Images	Class
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<p>Initial membership estimates</p> 	<p>Same for all classes</p>
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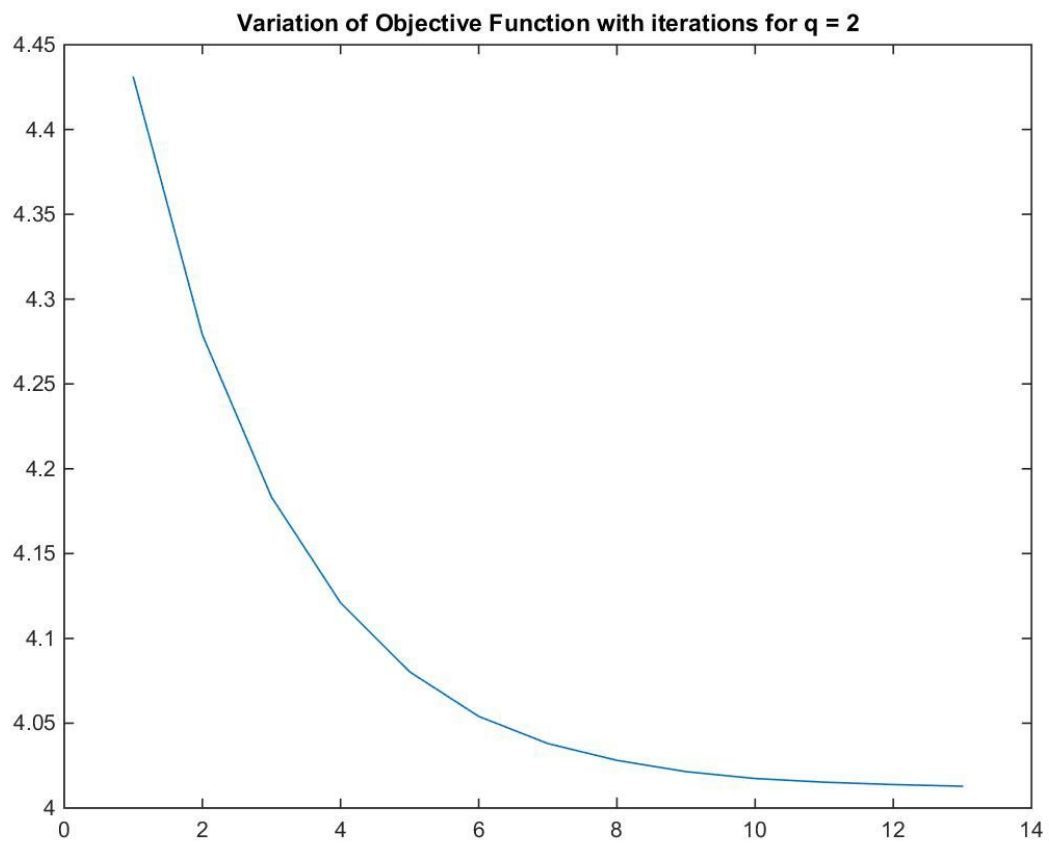
#### **Part d**

Initial Estimation of class means =  $[0.25, 0.5, 0.75]$

We have chosen some random points among the data as class means with the intuition that they are representative of the data.

#### **Part e**

Variation of Objective function is as follows

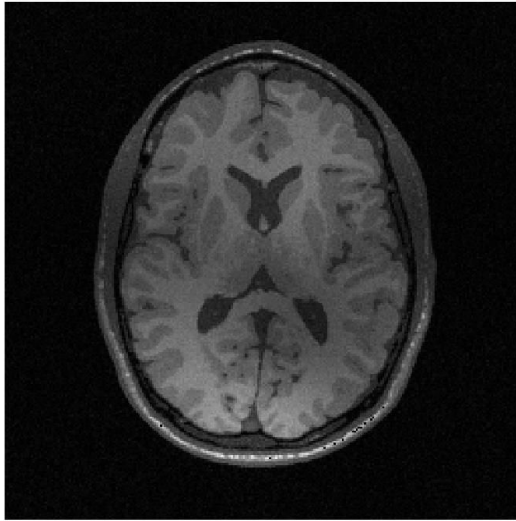


**Part f**

Optimal Images

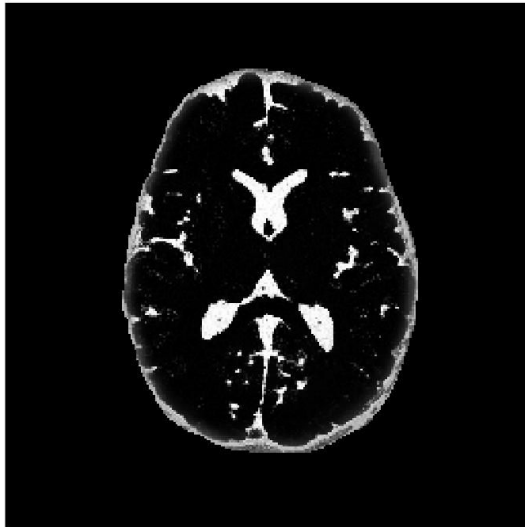
Images	Description
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Corrupted Image of brain



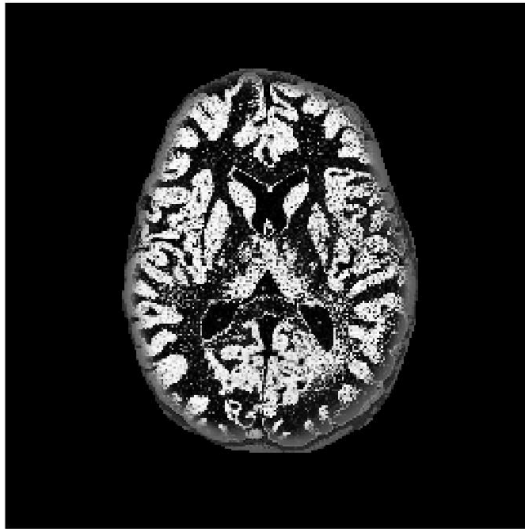
Corrupted Image  
(given input)

Memmbership for first class with  $q=2$



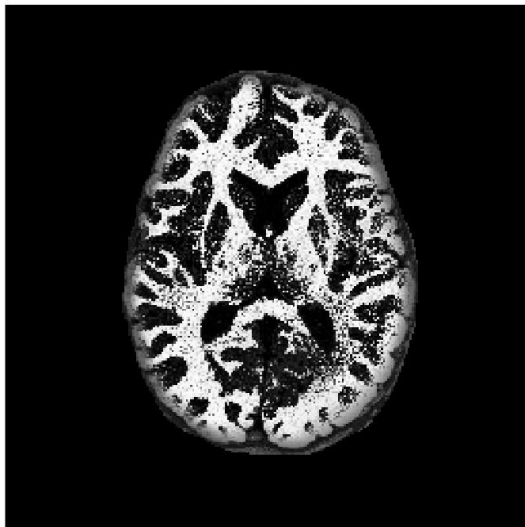
Class 1  
Membership

Memmbership for second class with  $q=2$



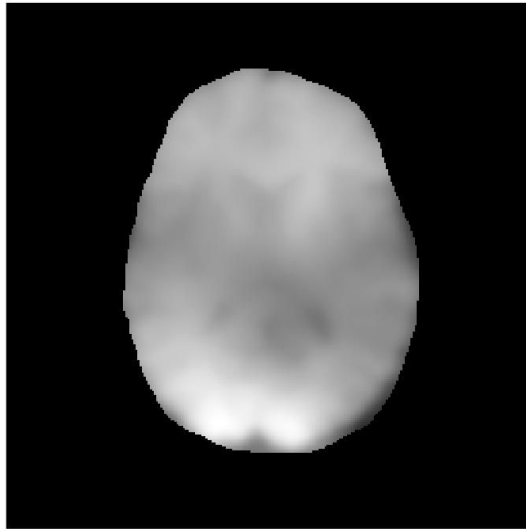
Class 2  
Membership

Memmbership for third class with  $q=2$



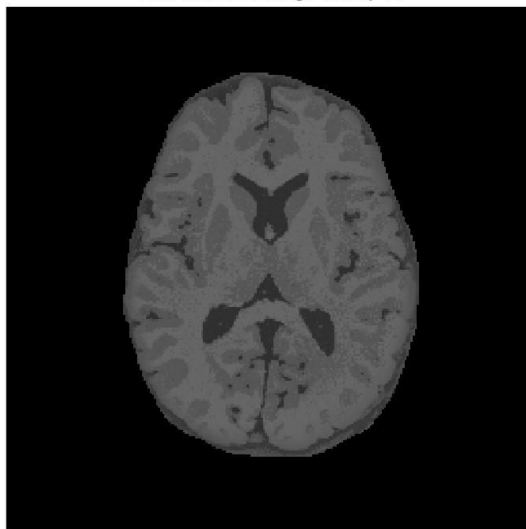
Class 3  
Membership

Bias Field Estimates with  $q=2$

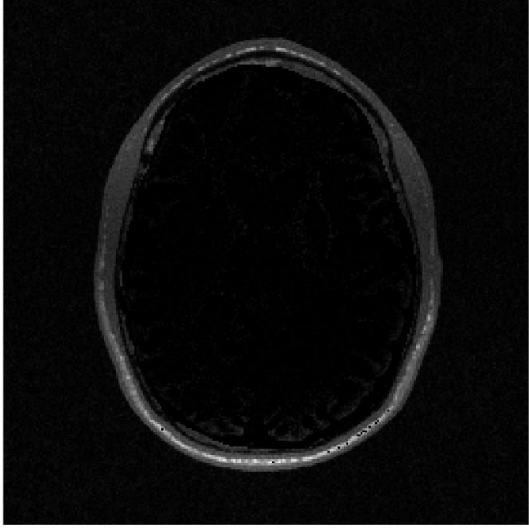


Optimal Bias  
Field Image

Bias removed image with  $q=2$



Optimal Bias  
Removed Image

<p>Residual image with <math>q=2</math></p>  A grayscale residual image of a brain scan. The image shows a cross-section of a brain with a dark, irregularly shaped region in the center, surrounded by a lighter, more uniform ring. The background is black.	<p>Residual Image</p>
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### Part g

Optimal Class means = [ 0.2642, 0.4798, 0.5763]

### Disclaimer

All the above images in high resolution can be located in 'images' folder of corresponding question. White in membership image correspond to high probability and all images are with respect to same colormap.